

WHAT IS CLAIMED IS:

1. An apparatus for the conversion of mercaptans comprising:

a reactor vessel comprising:

a first end and a second end;

5 at least one inlet for delivering a feed including hydrocarbons containing mercaptans, oxygen and aqueous alkaline solution to said reactor vessel;

a reaction section of said reactor vessel for accommodating a solid catalyst therein;

10 a hydrocarbon outlet for withdrawing a sweetened hydrocarbon stream from said reactor vessel, said hydrocarbon outlet being positioned between said first end of said reactor vessel and said second end of said reactor vessel; and

an aqueous alkaline outlet for withdrawing predominantly aqueous alkaline solution from said reactor vessel, said aqueous alkaline outlet being
15 positioned closer to said second end than said hydrocarbon outlet;

an outlet conduit in communication with said hydrocarbon outlet; and

a residual alkaline removal unit in communication with said outlet conduit.

2. The apparatus of claim 1 further comprising a first end of said reactor vessel defining a reaction section and a second end defining a separation section and a fluid
20 permeable shield supporting solid catalyst thereabove, a first side of said fluid permeable shield partially defining a reaction section and a second side of said fluid permeable shield partially defining a separation section.

3. The apparatus of claim 1 wherein said residual alkaline removal unit is a water wash column.

4. The apparatus of claim 2 wherein all of said fluid passing from said reaction section to said separation section passes through a fluid permeable shield.

5 5. The apparatus of claim 4 wherein said fluid permeable shield is positioned between said inlet and said second end of said vessel.

6. The apparatus of claim 1 further comprising a drain pot vessel in communication with an aqueous alkaline outlet.

7. The apparatus of claim 6 wherein an aqueous recycle line returns aqueous
10 alkaline solution from said drain pot vessel back to said reactor vessel.

8. The apparatus of claim 1 wherein said residual alkaline removal unit is a sand filter vessel.

9. The apparatus of claim 1 further including a baffle between said inlet and said hydrocarbon outlet.

15 10. The apparatus of claim 1 further including a collector protruding into said reactor vessel in communication with said hydrocarbon outlet.

11. A process for converting mercaptans comprising:

mixing a hydrocarbon feed having an initial boiling point of at least 300°F

containing mercaptans with a catalyst promoter;

20 delivering said hydrocarbon feed and said catalyst promoter to a reaction section of a reactor vessel;

delivering an aqueous alkaline solution and oxygen to said reaction section;

contacting said hydrocarbon feed containing mercaptans with an oxidation catalyst on a solid support to produce a hydrocarbon product with a lower concentration of mercaptans than in said hydrocarbon feed;
passing all of said hydrocarbon product and aqueous alkaline solution through a fluid permeable shield to a separation section of said reactor vessel;
5 generating an interface between said hydrocarbon product and said aqueous alkaline solution with a hydrocarbon side and an aqueous alkaline side of said interface;
withdrawing hydrocarbon product from said hydrocarbon side of said interface;
10 and
withdrawing aqueous alkaline solution from said aqueous alkaline side of said interface.

12. The process of claim 11 further comprising passing said hydrocarbon product to a residual alkaline removal unit.

15 13. The process of claim 12 wherein said residual alkaline removal unit is a water wash column and further comprising adding water to said hydrocarbon product before it enters said water wash column to mix said hydrocarbon product and said water before entering said water wash column.

14. The process of claim 11 wherein said catalyst promoter is a liquid.

20 15. The process of claim 11 wherein said hydrocarbon feed, said oxygen, said catalyst promoter and said aqueous alkaline solution are all mixed together before entering said reactor vessel.

16. The process of claim 11 further including subjecting said hydrocarbon product to a water wash without first undergoing settling.

17. A process for converting mercaptans comprising:

contacting a hydrocarbon feed containing mercaptans and naphthenic acids with a

5 first aqueous alkaline solution to convert said naphthenic acids to salts and

remove said salts from said hydrocarbon feed;

delivering said hydrocarbon feed having a reduced concentration of naphthenic

acid and a catalyst promoter to a reaction section of a reactor vessel;

delivering a second aqueous alkaline solution and oxygen to said reaction section;

10 contacting said hydrocarbon feed containing mercaptans and aqueous alkaline

solution with an oxidation catalyst on a solid support in the presence of an

aqueous alkaline solution to produce a hydrocarbon product with a lower

concentration of mercaptans than in said hydrocarbon feed;

passing all of said hydrocarbon product and said aqueous alkaline solution

15 through a fluid permeable shield to a separation section of said reactor vessel;

generating an interface between said hydrocarbon product and said aqueous

alkaline solution with a hydrocarbon side and an aqueous alkaline side of said interface;

20 withdrawing hydrocarbon product from said hydrocarbon side of said interface;

and

withdrawing aqueous alkaline solution from said aqueous alkaline side of said interface.

18. The process of claim 17 wherein at least one of said second aqueous alkaline solution and said catalyst promoter are continuously added to said reactor vessel.

5 19. The process of claim 18 wherein at least one of said second aqueous alkaline solution and said catalyst promoter are continuously added to said hydrocarbon feed before delivery to said reactor vessel.

20. An apparatus for the conversion of mercaptans comprising:

a reactor vessel comprising

10 a first end defining a reaction section and a second end defining a separation section;

at least one inlet for delivering a feed including hydrocarbons containing mercaptans, oxygen and aqueous alkaline solution to said reaction section of said vessel;

15 a fluid permeable shield to support solid catalyst thereabove, a first side of said fluid permeable shield partially defining said reaction section and a second side of said fluid permeable shield partially defining said separation section;

20 a hydrocarbon outlet for withdrawing a predominantly hydrocarbon stream from said separation section of said vessel, said hydrocarbon outlet being positioned between said fluid permeable shield and said second end of said vessel; and

an aqueous alkaline outlet for withdrawing predominantly aqueous alkali from
said separation section of said vessel, said aqueous alkaline outlet being
positioned closer to said second end than said hydrocarbon outlet;

an outlet conduit in communication with said hydrocarbon outlet; and

5 a residual alkali removal unit in communication with said outlet conduit.